A weighted four-point finite-difference approximation of the nonlinear partial differential equations is used in the BRANCH model. The finite difference technique is described in detail by Schaffranek and others (1981). A weighted four point implicit solution scheme is used because it can be applied with unequal time steps, varied throughout the range of approximation from box-centered to a fully-forward scheme, and its stability-convergence properties can be controlled. The flow equations are linearized and solved by implicit means. An iterative technique is used to solve for the unknown quantity.

The model uses values computed at the current time level as the initial condition for computing the next time-step quantities and proceeds step by step to the designated end of the simulation. Initial values of stage and discharge are required to start the simulation. These values can be obtained by measurement, computed from another source, derived from a previous unsteady flow simulation, or estimated.

ATLANTIC INTRACOASTAL WATERWAY FLOW MODEL

The BRANCH model requires that either the water-surface elevation or the water discharge be known at the boundaries of the network being simulated. Water-surface elevations from gages at Highway 544 (02110725), Myrtlewood Golf Course (02110760), Briarcliffe Acres (02110755), and Highway 9 (02110777) were used as the boundary conditions for the AICW flow model.

The Myrtlewood-to-Briarcliffe boundary condition was used from October 1981 until October 14, 1982. The Highway 544-to-Highway 9 boundary condition was used from October 15, 1982 to September 30, 1986. The Highway 544-to-Myrtlewood and Myrtlewood-to-Highway 9 boundary conditions were used for periods when data were missing at either the Highway 544 or Highway 9 gage and data were available for the Myrtlewood gage during the 1983-86 water years.

Flow records were generated for the AICW by applying the BRANCH model to four combinations of boundary conditions at the four stations where stage data were collected (figs. 4 and 5).

The increase in drainage area between Highway 544 and Highway 9 is approximately 79 square miles. Roughly 93 percent of this area is rural and roughly 7 percent is urban. Tributary inflow from the rural area was not considered significant because roughly 29 percent of the rural area is designated as swamps on U.S. Geological Survey topographic maps and the remainder is flat, heavily wooded, and poorly drained. Inflow from the urban areas may be significant during periods of local flooding, but was ignored in the study. Point source inflows and outflows were not considered significant enough to require their inclusion in the study.

Cross-section geometry for use in the model was determined by surveying above the water surface and by soundings and by fathometer below the water surface. Cross-sectional areas varied from 303 to 1,830 ft^2 at mean sea-level elevations. Top widths varied from 198 to 360 feet. Sea-level datum was used for water-surface elevations and cross-section geometry. The